Differential refract meter f r liq. chr matography - has interi r h using which is temp. c ntr lled t impr ve accuracy and reduce wt., LED and semic nductor heat s urce

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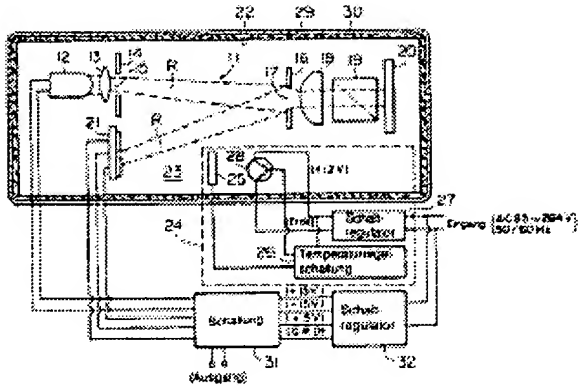
The differential refractometer has a light source (12), a lens (13) and a light source slit (14). The optical section (11) has a light path (R) leading from this slit, a collimator lens (18), a measuring cell (19) behind which is a reflecting lens (20) which reflects light onto a light receptor (21). The device is enclosed in a heat conducting casing (22).

The novel feature is that the refractometer has a temp. control system (24-28) with a temp. sensor (25), a semiconductor element (28) which acts as a heat source, and a switch (26) which controls the semiconductor element in accordance with the temp. sensed by the sensor.

Pref. the light source consists of a light emitting diode, and the housing is covered inside or outside with a thermal insulating foam 1-2mm thick (30) and an Al foil (29). The housing may also consist of an Al block. A slit (16) is located in the light path near the measuring cell, and the housing consists of an Al block.

USE/ADVANTAGE - For liq. chromatography. The new device is of light wt., reduced size and higher output. The need to correct the results for variations in internal temp. in the housing is eliminated.



CLAIMS

[Utility model registration claim]
[Claim 1] A reflective mirror is made to intervene that an optical path should be formed between the light source and a light sensing portion, and a measurement cel is arranged between the light sources and reflective mirrors in said optical path. In differential refractive-index detection equipment for liquid chromatography which it controls and comes to arrange optical system formed -- the inside of an aluminum block -- constant temperature -- constant temperature [as opposed to / form said light source using LED and / optical system within an aluminum block] -- control A temperature sensor and a semiconductor device as a heat source are arranged in an aluminum block which has arranged sponge material for heat insulation whose thickness is 1-2mm inside, has arranged aluminum foil outside, and carried out the jacket. Differential refractive-index detection equipment for liquid chromatography characterized by performing a switching regulator for said semiconductor device which operates based on a temperature condition which said temperature sensor detects using a temperature control means which it has at least.

[Translation done.]

DETAILED DESCRIPTION

[Detailed explanation of a design]
[0001]
[Industrial Application]
This design starts the differential refractive-index detection equipment for liquid chromatography, in more detail, is highly efficient and, moreover, is related with the differential refractive-index detection equipment for liquid chromatography which can realize a lightweight miniaturization.
[0002]
[Description of the Prior Art]
It can divide roughly into the general-purpose detection means of solution object genotypes, such as differential refractive-index detection equipment, and the unique mold detection means of solute object genotypes, such as ultraviolet absorption detection equipment, about a detection means to constitute a liquid chromatograph.
[0003]
Among these, since the ultraviolet absorption detection equipment which is a unique mold detection means generally could not receive fluctuation of extrinsic factors, such as a temperature change of a mobile phase solvent, and pulsation of a flow rate, easily, although it had the features which can carry out [high sensitivity]-izing easily, it had the difficulty which cannot be applied when not dependent on the case where there is no ultraviolet absorption nature in the matter, or specific wavelength.
[0004]
On the other hand, although the differential refractive-index detection equipment which is a general-purpose detection means was excellent in the point which can be used in the above-mentioned case which cannot use ultraviolet absorption detection equipment, in order to high-sensitivity-ize analysis precision, it needed to lessen external factors, such as a temperature change of a minute solvent, and flow rate (pressure) change.
[0005]
By the way, it sets to the refractive-index detection equipment which has such a property, especially the conventional type refractive-index detection equipment of a polarization mold as shown in drawing 2 . After the optical path R which comes out of the light source 2 formed with a filament mold lamp, and is formed was condensed with the lens 4 through the slit 3, Pass the measurement cel 5, and result with the reflective mirror 6 and the reflected light passes the measurement cel 5 again. It reaches to the light sensing portion 7 which consists of a halved photo detector, is changed into an electrical signal by this light sensing portion 7, and is formed by arranging the optical system 1 which enabled it to detect a refractive index by performing predetermined processing.
[0006]
In the case of the differential refractive-index detection equipment for liquid chromatography which comes to have such optical system 1 A condition must be made to hold. the whole of the optical system 1 since temperature dependence is in the refractive index detected -- temperature control -- carrying out -- constant temperature -- Therefore, the whole optical system 1 needed to be held in the aluminum block 8 with big heat capacity, and it needed to consider so that it might not be influenced of external ambient temperature by housing this aluminum block 8 using the sponge material 9 with a thickness of about 10-20mm further.
[0007]
[Problem(s) to be Solved by the Device]
By the way, a refractive index with a high precision is detectable with conventional differential refractive-index detection equipment.
[0008]
However, conventionally, since the light source 2 of equipment was a filament mold lamp, there was much calorific value and it had become the big cause of making the refractive index in which the various metal members which constitute equipment have a repeat in thermal expansion and cooling contraction, and this has temperature dependence

generating a drift.
[0009]
Moreover, since it had taken the measure which controls generating of a drift by enlarging the heat capacity of aluminum block 8 the very thing since the temperature change within the aluminum block 8 with which optical system 1 is held enlarged the rate of change of the gap of an optical path R which results from the light source 2 to a light sensing portion 7, and also it needed to line the sponge material 9 with a thickness of about 10-20mm, it had the inconvenience which the whole enlarges as a result.
[0010]
On the other hand, in order to prevent generating of a drift, the power supply section having the transformer which needs to carry out temperature control of the inside of the aluminum block 8 with which optical system 1 is held, therefore has weight was needed, and there was also a problem from which this power supply section causes pyrexia.
[0011]
And in order to devise exoergic prevention of such a power supply section, the various devices for it were also needed, the configuration of the whole equipment was enlarged as a result, and there was inconvenience which keeps product cost as a high thing.
[0012]
[Means for Solving the Problem]
This design is made in view of the above-mentioned technical problem of the conventional technology. The feature on the configuration In differential refractive-index detection equipment for liquid chromatography which it controls and comes to arrange optical system which a reflective mirror is made to intervene that an optical path should be formed between the light source and a light sensing portion, and arranges a measurement cel and is formed between the light sources and reflective mirrors in said optical path -- the inside of an aluminum block -- constant temperature -- constant temperature [as opposed to / form said light source using LED and / optical system within an aluminum block] -- control A temperature sensor and a semiconductor device as a heat source are arranged in an aluminum block which has arranged sponge material for heat insulation whose thickness is 1-2mm inside, has arranged aluminum foil outside, and carried out the jacket. It is in having been made to perform a switching regulator for said semiconductor device which operates based on a temperature condition which said temperature sensor detects using a temperature control means which it has at least.
[0013]
[Function]
for this reason, the temperature control means which sweeps the unnecessary source of pyrexia, moreover miniaturizes, and is formed out of the aluminum block with which optical system is held -- optical system -- constant temperature -- since Lycium chinense grows on the basis of a condition, it is lightweight small and, moreover, highly efficient equipment can be offered.
[0014]
[Example]
Hereafter, based on a drawing, the example of this design is explained in full detail.
[0015]
Drawing 1 is explanatory drawing showing the outline of the equipment configuration concerning this design.
[0016]
the optical system 11 which according to this drawing the reflective mirror 20 is made to intervene that the whole equipment should form an optical path R between the light source 12 and a light sensing portion 21, and arranges the measurement cel 19 and is formed between the light sources 12 and the reflective mirrors 20 in said optical path R -- the inside of the aluminum block 22 -- constant temperature -- it arranges possible [temperature control] and is constituted so that a condition may be maintained.
[0017]
In this case, that diameter is formed using LED which comes to have a luminescence side equivalent to the point light source which it is around 1mm, and said light source 12 is 1-1.5mm in that approaching front. The light source side slit 14 section for having the slit 15 of the breadth of order and equalizing the exposure quantity of light makes a condenser lens 13 intervene, and is arranged.
[0018]
Moreover, the measurement cel side slit section 18 which has the slit 17 formed by the breadth around 1mm for removing the scattered light unnecessary for an optical path R from the light source 12 which goes straight on through a condenser lens 13 and the light source side slit section 14, and the reflective mirror 20 make a collimator lens 18 intervene, and contiguity arrangement is carried out.
[0019]

Furthermore, ahead [of the optical path R which was reflected by the reflective mirror 20 and passed through the measurement cel 19 and the measurement cel side slit section 16 again], the light sensing portion 21 which consists of a two-pièce-housing optoelectric transducer is arranged.
[0020]
the aluminum block 22 with which the optical system 11 which consists of such a configuration on the other hand is held -- optical system 11 -- constant temperature -- since it is necessary to control, it has the temperature control means 24 which consists of the temperature sensor 25 and semiconductor device 28 which are arranged in the interior 23 of the aluminum block 22, and the thermal control circuit 26 arranged in the exterior of the aluminum block 22 and a switching regulator 27, and is formed.
[0021]
among these, a temperature sensor 25 is used in order to detect the temperature condition inside [23] the aluminum block 22 -- having -- a semiconductor device 28 -- the aluminum block 22 -- temperature control -- carrying out -- constant temperature -- it is used as a heat source at the time of maintaining a condition. Moreover, a thermal control circuit 26 is used in order to open and close a circuit based on the temperature condition which said temperature sensor 25 detects with a switching regulator 27.
[0022]
As said semiconductor device 28 which is a heat source, it is desirable to use a power transistor and it is used as a heat source to which it was made to change collector current by impressing a constant voltage between an emitter and a collector in this case, and controlling base current.
[0023]
Moreover, the jacket of the aluminum block 22 in this design will be carried out by arranging the sponge material 30 for heat insulation whose thickness is 1-2mm inside, and arranging aluminum foil 29 outside, and the inside and outside of the aluminum block 22 will be isolated thermally by this.
[0024]
In addition, as for 32, the sign 31 in drawing shows a switching regulator for the circuit for stabilizing the quantity of light of LED or amplifying the voltage which the light sensing portion 21 detected, respectively.
[0025]
Since this design is carried out in this way and constituted, as a heat source used for temperature control It changes to the Nichrome heater which needs big power and a comparatively large space. It is being able to use the semiconductor device 28 arranged in the aluminum block 22, being able to perform the actuation moreover using a switching regulator 27, and losing various kinds of components, such as a required transformer, conventionally. The lightweight miniaturization of the whole equipment which held optical system 11 can be carried out eliminating the unnecessary source of pyrexia from the interior 23.
[0026]
Moreover, since the light source 12 is changed to a filament mold lamp and formed using LED, the request itself of preventing generating of a drift by being able to lessen calorific value from the light source 12, therefore enlarging heat capacity will become unnecessary, and it can promote the miniaturization of the aluminum block 22 further.
[0027]
And that generating of a drift can be controlled can promote the miniaturization of the aluminum block 22 with which optical system 11 is held also from this point through the ability to make shorter than before the length of the optical path R in which it results [from the light source 12] to a light sensing portion 21.
[0028]
Since the miniaturization of the aluminum block 22 realized by doing in this way on the other hand raises heat responsibility inevitably, and makes temperature control easy and it can shorten the makeup time of equipment itself substantially, it can realize the increase in efficiency of analysis.
[0029]
[Effect of the Device]
As stated above, according to this design, the source of pyrexia unnecessary out of the interior in which optical system is held is swept. And can miniaturize the aluminum block itself by miniaturizing a temperature control means, and also The highly efficient equipment which could make the thickness thin by making the sponge material for heat insulation which carried out the jacket to the aluminum block intervene inside aluminum foil, therefore carried out the lightweight miniaturization of the whole further can be offered.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] Explanatory drawing showing an example of the outline configuration of the equipment concerning this design.
[Drawing 2] Explanatory drawing showing an example of the outline configuration of equipment conventionally.
[Description of Notations]
11 Optical System
12 Light Source
13 Condenser Lens
14 Light Source Side Slit Section
15 Slit
16 Measurement Cel Side Slit Section
17 Slit
18 Collimator Lens
19 Measurement Cel
20 Reflective Mirror
21 Light Sensing Portion
22 Aluminum Block
23 Interior
24 Temperature Control Means
25 Temperature Sensor
26 Thermal Control Circuit
27 Switching Regulator
28 Semiconductor Device
29 Aluminum Foil
30 Sponge Material for Heat Insulation
R Optical path